

What is claimed is:

1. A method of manufacturing a semiconductor laser comprising the steps of:

forming a semiconductor layer on a substrate;

5 forming periodic concave and convex portions on the semiconductor layer;

deforming flat surfaces of the convex portions in the semiconductor layer into slant surfaces that are inclined toward bottom portions of the concave portions;
10 and

forming an active layer in which quantum dots are arranged three-dimensionally only on insides of the concave portions.

2. A method of manufacturing a semiconductor laser,
15 according to claim 1, wherein the concave portions are formed to have a width that is wider than the convex portions.

3. A method of manufacturing a semiconductor laser, according to claim 1, wherein the concave and convex
20 portions are formed periodically along a light propagation direction at a period that is set to a same extent as a positive-integral multiple of $1/2$ of a wavelength of the quantum dots in the waveguide.

4. A method of manufacturing a semiconductor laser,
25 according to claim 1, wherein the quantum dots are formed in a self-formation manner.

5. A method of manufacturing a semiconductor laser

comprising the steps of:

forming a first layer made of a first semiconductor layer on a substrate;

5 forming periodic stripe-like grooves on the first layer;

deforming flat surfaces of the first layer between the grooves into slant surfaces that are inclined toward bottom portions of the grooves, by heating the first layer together with the substrate; and

10 forming quantum dots only on the bottom portions of the grooves by utilizing a difference between lattice constants, by depositing a second semiconductor on insides of the grooves.

15 6. A method of manufacturing a semiconductor laser, according to claim 5, wherein deposition of the second semiconductor is executed by a molecular beam epitaxy method.

20 7. A method of manufacturing a semiconductor laser, according to claim 5, wherein a width of the grooves is set wider than a width of the flat portions between the grooves.

8. A method of manufacturing a semiconductor laser, according to claim 5, wherein the quantum dots are formed on insides of the grooves as a layered-structure.

25 9. A method of manufacturing a semiconductor laser, according to claim 5, wherein the substrate is formed of any one of a GaAs semiconductor substrate, an InGaAs

semiconductor substrate, and an InP semiconductor substrate.

10. A method of manufacturing a semiconductor laser, according to claim 5, wherein the quantum dots are made
5 of any one of InAs, InGaAs, InGaAsP, and GaInNAs.

11. A method of manufacturing a semiconductor laser, according to claim 5, wherein the first layer is made of GaAs.

12. A method of manufacturing a semiconductor laser,
10 according to claim 5, wherein the grooves are formed at a period that is set to a same extent as a positive-integral multiple of $1/2$ of a wavelength in the waveguide.

13. A method of manufacturing a semiconductor laser, according to claim 5, wherein a pitch of the grooves is
15 set such that a wavelength of an output light becomes $1.3 \mu\text{m}$.

14. A method of manufacturing a semiconductor laser, according to claim 5, wherein a pitch of the grooves is set such that a wavelength of an output light becomes
20 $1.55 \mu\text{m}$.